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Research Article

PREPARATION AND ANALYTICAL STUDY OF *RASKARPUR*

Gaonkar S Gayatri

Assistant Professor, Dept. of Rasashastra, R.A.Podar Medical College (Ayur), Worli, Mumbai, Maharashtra, India.

ABSTRACT

Parad Murchana is the backbone of Rasashastra which is a branch of Ayurveda. *Murchana* signifies the formulations of mercury after *Shodhan* (purification). *Parad* can only be utilized therapeutically post *Murchana*. It is broadly classified into *Sagandha* (mercury with *Gandhak*) and *Nirgandha* (mercury without *Gandhak*) and each of it is further classified (for better learning) into *Kharaliya, Parpati, Pottali and Kupupakva kalpanas*, the later being better than the former with respect to its potency and action. This is due to the increased duration of *Agni sanskara* (heat given) as rightly quoted by Charaka in Charak Sanhita that *Sanskar* increases *Guna* (properties). *Raskarpur* is a *Kupipakva-nirgandha kalpana*. *Nirgandha kalpana* have always held a secondary status as compared to the *Sagandha* as the later are termed safer to use than the former. Mercury when combined with *Gandhak* (sulphur) becomes stable and less toxic. *Nirgandha* on the other hand needs to be administered in a proper dosage and for an appropriate duration only. This research is an attempt to study a *Nirgandha kalpana* and thus *Raskarpur* was taken . All the various versions of *Raskarpur* were studied and finally the Rastarangini version was selected. In order to bring uniformity in the drug prepared 2 batches of *Raskarpur* were prepared. This also helped to standardize the process. It was observed that the compound HgCl was formed at 100-110^0. *Raskarpur* once prepared was tested for confirmation of the compound formed. During analysis 1 market sample was randomly taken and all 3 *Raskarpur* samples were analysed with their results compared with the standards. It was found that the percentage of Hg was very low as compared to the standards, that of the market sample being the lowest. The reason for the same needs to be evaluated. This study is a first attempt towards studying Raskarpur further research needs to be done using other versions.

KEYWORDS: *Murchana, Nirgandha, Sagandha, Raskarpur, Parad.*

INTRODUCTION

The process that definitely instills disease eradicating property into mercury by combining it with a single or mlultiple *dravyas* using different methods is known as *Murchana*[1]. Also due to this process *Parad* (mercury) looses its *Ghanata* (hardness) and *chapalta* (unsteadiness/swiftness) [2] . *Murchana* is further classified into *Sagandha* and *Nirgandha*[3]. *Sagandha murchana* is said to be safe and used abundantly as compared to the *Nirgandha*. This is due to the fact that *Gandhak* helps in curbing any toxic effects that might arise due to consumption of mercury [4]. And thus the use of *Nirgandha kalpas* are limited. The three most widely known N*irgandha kalpas* are *Mugdha rasa* (grey powder), *Rasapushpa* and *Raskarpur*. *Mugdha rasa* is a *Kharaliya kalpana* whereas the other two are *Kupipakva kalpana*.

In our texts many versions of *Raskarpur* are described, for this study the Rasatarangini version was selected. The *Kupipakva* method wherein the white coloured R*askarpur* is formed at the neck of the *kupi*. It looks like *Karpur* (camphor) thus the name. The drug was prepared in 2 batches to bring about uniformity in the method of preparation i.e., to create Standard Operating Procedures (SOPs) for preparation of *Raskarpur*.

The prepared batches were then analyzed and compared with the standards. Also a market sample of *Raskarpur* was bought and this too was analyzed. The results of all the 3 samples were then compared.

MATERIALS AND METHODS

Materials: *Parad* (Mercury), *Gandhakamla* (conc. Sulphuric acid) and *Saindhav* (Sodium chloride).

Instruments: Weighing machine, Stone *Kharal*, Stainless Steel spatula, Conical flask with attached 'C' shaped glass tube to its mouth, rubber pipe, spirit lamp, tripod stand, kerosene stove, *Kupi* (7 layered), *Valuka yantra*, Gas-stove, Pyrometer, glass container and other instruments required for analysis.

Preparation of *Raskarpur*

Step I: *Shodhan* of raw materials

1. *Parad samanya shodhan*[5]

was done by HNO3 method. (70% conc. HNO3 =30ml, Water=70ml and Mercury =100gms & asbestos chips) Soaked together for an hour.

The above method was selected from Ayurvediya Rasashastra- Siddhinandan Mishra.

Parad before *Shodhan*: 800gms. *Parad* after *Shodhan* : 659 gms.

Table1. *Parad samanya* and *Vishesh shodhan*

Shodhan	**I. *Parad shodhan*-HNO3 method**			**II. *Parad Vishesh Shodhan***		
Time required	1 hour			24 hours		
Procedure	Soaking			Trituration		
	Parad* before *Shodhan	***Parad* after *Shodhan***	**Loss incurred**	***Parad* before *Shodhan***	***Parad* after *Shodhan***	**Loss incurred**
	900gms	839gms	9%	815gms	780gms	9.5%

2. *Parad Vishesh shodhan*[6]

Chitrak mul kwatha, Triphala kwatha, Kumari, Nagvelli patra, Adrak, Haridra swaras, Rason kalka and Saindhav (each 1/16th of *Parad*) were added and triturated until *Parad* got completely homogeneous with these drugs. Time taken 24 hours.

The above drugs were selected as they were used in *Vishesh shodhan* of *Parad* as well as since they possessed *Kushtagna* properties. It was in the wake, if at all *Rasakarpur* had to be used in future for some skin disease.

Parad before *Shodhan*: 815gms. *Parad* after *Shodhan* : 780 gms. [Table 1]

Step II: Preparation of Mercuric Sulphate[7]

Purified *Parad* (250gms) and Sulphuric acid (375ml) are taken together in a conical flask. Its mouth was fixed with a rubber cork and a 'C' shaped glass tube was attached to it and on its rear end a rubber tube was fixed. The other end of the rubber tube was immersed in a glass cylinder. The mixture was heated on a kerosene stove until a white powder was formed. Total time taken: 18 hours.

Mercuric sulphate obtained: 375gms

Step III: Preparation of *Raskarpur* mixture[7]

350 gms each of Mercuric sulphate and *Saindhav* were taken and triturated in a stone *Kharal* until a homogeneous fine mixture is obtained. 700gms of mixture was obtained.

Time taken: 3 hours.

Step IV: Preparation of *Raskarpur*[7]

Raskarpur mixture 300gms was filled in a 7 layered *Kupi* and this was then immersed in a *Valuka yantra* and heated with constant *Manda* and *Madhyam agni* (upto 360^{0}C)[11] for 12 hours on a Gas stove.

Table 2: Observations and temperature chart :*Raskarpur* : Batch I

Duration	**Temperature**		**Observations**
	Valuka	***Kupi***	
1 hour	98^{0}C	80^{0}C	Mixture melted
1 ½ hours	110^{0}C	84^{0}C	White fumes started coming out
2 ½ hours	110^{0}C	92^{0}C	Mixture feels like wet sand
5 hours	100^{0}C	78^{0}C	Fumes reduce as temp. falls down
6 hours	106^{0}C	88^{0}C	Mixture turns hard, fumes reduced
7 hours	130^{0}C	110^{0}C	White crystals start forming at the neck of *Kupi*
9 hours	160^{0}C	122^{0}C	Fumes stopped coming out, Cork applied
12 hours	360^{0}C	----	Heat stopped

After stopping the heat the *Kupi* was allowed to self cool overnight. The next morning *Kupi* was removed from the *Valuka yantra*, its layers scraped and broken midway to acquire white coloured crystal like *Raskarpur* at the neck of the *Kupi*.

Raskarpur acquired : 114 gms.

Similarly Batch 2 was prepared. *Raskarpur* acquired 108gms of 300gms mixture.

Table 3: Observations and temperature chart :*Raskarpur* : Batch II

Duration	**Temperature**		**Observations**
	Valuka	***Kupi***	
1 hour	94^{0}C	80^{0}C	Mixture melted
1 ½ hours	100^{0}C	82^{0}C	White fumes started coming out
2 ½ hours	108^{0}C	86^{0}C	Mixture feels like wet sand
5 hours	110^{0}C	90^{0}C	Fumes reduce as temp. falls down
6 hours	110^{0}C	94^{0}C	Mixture turns hard, fumes reduced
7 hours	130^{0}C	110^{0}C	White crystals start forming at the neck of *Kupi*
9 hours	156^{0}C	120^{0}C	Fumes stopped coming out, Cork applied
12 hours	340^{0}C	----	Heat stopped

Both the times a grey coloured powder was obtained at the bottom of the *Kupi* which was saline in taste.

Confirmatory Test of *Raskarpur*[8]

A pinch of *Raskarpur* was taken and dissolved in distilled water in a test tube. Then 3 drops of ammonia was added to this solution. White precipitate was found at the

bottom of the test tube. This confirms that the compound formed is Mercuric Chloride ($HgCl_2$) and *Raskarpur* is also known as Mercurous chloride.

Analytical study of *Rasapushpa*

Step I : Raw material analysis

2 samples of *Saindhav* were bought from the market and their quantitative analysis was done. The one having higher concentration of the compound NaCl was selected for the drug preparation.

Table 4 : Analytical value *Saindhav*

Saindhav sample 1	NaCl- 96.09%
Saindhav sample 2	NaCl- 98.34%

Namboori Phased spot test of *Parad*[9]

Namboori phased spot test was performed on the crude mercury brought from the market. Also the same test was performed post *Parad shodhan* with HNO3 method. Before showed presence of *Naag* and *Vanga* metals and after showed the absence of them.

For the study 10% potassium iodide paper was taken. Samples of both crude and HNO3 purified mercury were prepared separately by adding 1ml of 5N HNO3 to 2 gms of mercury and kept still for 20 mins.

Later a drop of this solution was put on the potassium iodide paper (Whatman's paper no.1 & 10% potassium iodide solution) to see the immediate colour changes.

Table 5 : NPST of *Ashuddha* and *Shuddha Parad*

Ashuddha Parad		***Parad* purified with HNO3**	
Observations	**Interpretations**	**Observations**	**Interpretations**
Yellow spot in the centre surrounded by a orange band of ring. Lastly a brown ring.	Yellow spot seen at the centre signifies the presence of *Vanga* and *Naag*	Orange spot surrounded with brown	Absence of yellow spot signifies absence of *Vanga* and *Naag*.

Tests performed on *Raskarpur*

Tests were performed on two batches of *Raskarpur* prepared and one market sample for comparison.

Organoleptic characters such as colour, taste, odour and touch were observed.

Table 6: Organoleptic characters of *Raskarpur*

Characters	**Batch I**	**Batch II**	**Market sample**	**Standard**
Colour	Grayish white	Grayish white	White	White
Odour	Odourless	Odourless	Odourless	Odourless
Taste	Salty	Salty	Salty	Saline
Touch	Rough	Rough	Rough	---

Ash value, Acid insoluble Ash value, **estimation of mercury and chloride** were done and their values were compared with the standards.

Table 7: *Raskarpur* Batch 1, 2 and market sample analysis

Standards	**Batch I**	**Batch II**	**Market sample**	**Standards***
Ash Value[10]	1.7549	1.8615	22.60	--
Acid Insoluble Ash value[10]	1.2941	1.2587	0.82	--
Mercury Content in %[11]	50.49	51.34	20.47	65-75%
Chloride content in %[12]	26.50	24.34	13	24-33%

* Pharmacopoeical standards of Ayurvedic Formulations pg. 295

Namboori Phased spot test: [13]Two solutions of each of the two batches as well as the market sample were prepared, one by adding 0.5ml of 5N HNO3 and other by adding 0.5ml of distilled water to 0.125gm of *Raskarpur* each. In this way 6 samples were prepared. These samples were then heated and allowed to settle for 48hours.

After that the samples were shaken well before adding 2 drops on the potassium iodide paper(Whatman's paper no.1 & 10% potassium iodide solution) and their observations noted.

Table 8: Namboori phased spot test of *Raskarpur* Batch I

Phase I : Immediate observation			
HNO3	**Standard observation****	**Distilled water**	**Standard observation****
Purple spot in centre with a light purple ring surrounding it. And lastly dark brown band forms the outermost layer.	Immediately a brown spot forms. It further turns white with moderate deep brown periphery. Before the end of the 1st phase ½ tiny and irregular dark particles form in the centre of the spot.	Centre orange spot surrounded by broad light brown band with white circle in between.	Immediately a brown spot forms. It further turns white with moderate deep brown periphery.

Table 9: Namboori phased spot test of *Raskarpur* Batch II

Phase I : Immediate observation			
HNO3	**Standard observation****	**Distilled water**	**Standard observation****
Purple spot in centre with a light purple ring surrounding it. And lastly dark brown band forms the outermost layer.	Immediately a brown spot forms. It further turns white with moderate deep brown periphery. Before the end of the 1st phase ½ tiny and irregular dark particles form in the centre of the spot.	Centre orange spot surrounded by broad light brown band with white circle in between.	Immediately a brown spot forms. It further turns white with moderate deep brown periphery.

Table 10: Namboori phased spot test of *Raskarpur* Batch III

Phase I : Immediate observation			
HNO3	**Standard observation****	**Distilled water**	**Standard observation****
Purple spot in centre with a light purple ring surrounding it. And lastly dark brown band forms the outermost layer.	Immediately a brown spot forms. It further turns white with moderate deep brown periphery. Before the end of the 1st phase ½ tiny and irregular dark particles form in the centre of the spot.	Centre orange spot surrounded by broad light brown band with white circle in between.	Immediately a brown spot forms. It further turns white with moderate deep brown periphery.

** Manual of Namburi Phased spot test. pg. 39-42

RESULTS

White crystal like *Raskarpur* was collected at the neck of the *Kupi*. After preparing it in two batches the product acquired was 36-38% (108gms and 114gms respectively from 300gms) of the mixture taken.

It was also found that the mixture melted at 80^{0}C and the compound *Raskarpur* gets formed at the neck of the *Kupi* at about 110^{0}C.

Maximum heat given to the *Valuka yantra* was 360^{0}C.

Organoleptic characters, Ash value, Acid insoluble Ash value, Mercury content and Chloride content of *Raskarpur* results. [Table 6 & 7].

Also Namboori phased spot test of *Raskarpur* was conducted.

DISCUSSION

This study was a first step towards studying the least discussed *Nirgandha kalpana* of *Parad* and also to standardize *Raskarpur*. We see in our Ayurvedic texts that there are various versions of a single *Kalpa*. In order to study the drug properly we need to explore every version and standardize them. In the current study I selected the *Kupipakwa* version of *Raskarpur* given in Rasatarangini.

For the preparation of *Raskarpur manda agni* is indicated and I observed that the compound HgCl is formed at 100-110^{0}C temperature. If we consider the *Manda agni* as below 400^{0}C, yet the temperature of *Valuka* should not exceed 400^{0}C and the internal *Kupi* temperature should not exceed 110^{0}C. This is to avoid the dissociation of the HgCl compound which happens beyond 110^{0}C temperature.

Confirmatory test was performed to find out whether the compound of *Raskarpur* formed is HgCl (Mercurous chloride) or $HgCl_2$ (Mercuric chloride). Our test proved that the compound was indeed $HgCl_2$ as widely known.

The Analytical test regarding estimation of mercury in *Raskarpur* gave a gross variation as compared to the standards. The standards quoted mercury to be 65-70% whereas my results were 50.49 and 51.34%. The reason for the same seemed to be loss of mercury during the heating procedure. But for *Parad* whose boiling point is 357^{0}C to evaporate at 100-110^{0}C seems unbelievable and yet the results hold true. Mercury % of the market sample was way below standard 20.47%. Chloride percentage of both the batches were similar to the standards but for the market sample in which it was found to be very low. Even the ash value of the market sample was very high pointing toward its contamination.

Rest all the tests were as per the standards. Namboori phased spot test showed some variations with partial similarity. This could be because the method of preparation of *Raskarpur* used for NPST has not been mentioned and so it could be that the *Raskarpur* prepared by us and that by Dr. Namboori could be of different versions.

CONCLUSIONS

Raskarpur, Nirgandha kalpana of *Parad* when prepared by *Kupipakva* method is formed at 100-110^{0}C. It requires *Manda agni* as compared to the *Kramagni* in other *Sindur kalpanas*. It is a grayish white crystalline structure and the compound thus formed is $HgCl_2$ or Mercuric chloride.

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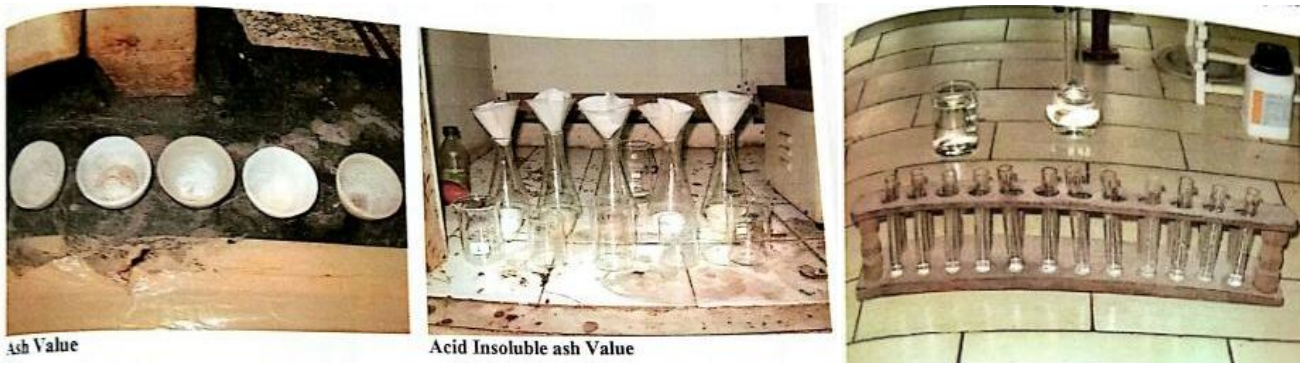
***Address for correspondence**
Dr. Gaonkar S Gayatri
Assistant Professor,
Dept. of Rasashastra.
R. A. Podar Medical College (Ayur),
Dr. Annie Beasant Road, Worli,
Mumbai- 400018.
Email: drgayatrig@rediffmail.com
Ph: 9987544098

Picture 1: Preparation of *Raskarpur*

Picture 2: Ash and Acid insoluble ash value test



Picture 3: Namboori Phased Spot Test